NOAA Fleet Update

April 2017

The following update provides the status of NOAA's fleet of ships and aircraft, which play a critical role in the collection of oceanographic, atmospheric, hydrographic, and fisheries data. NOAA's current fleet of 16 ships – the largest civilian research and survey fleet in the world – and nine aircraft, are operated, managed, and maintained by NOAA's Office of Marine and Aviation Operations (OMAO). OMAO includes civilians, mariners, and officers of the United States NOAA Commissioned Officer Corps (NOAA Corps), one of the nation's seven Uniformed Services.

Find us on Facebook for the latest news and activities.

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OMAO and the NOAA Corps – In the News

Life At Sea or Scientist on Land: NOAA Corps Offers Both

-NOAA Office of Response and Restoration Blog (Article by Cmdr. Jesse Stark, NOAA Corps)

A life at sea, or a career conserving natural resources? That was the choice I was contemplating while walking along the docks in Port Angeles, Washington, back in 1998. A chance encounter that day with the chief quartermaster of National Oceanic and Atmospheric Administration Ship Rainer showed me I could do both. Growing up in the Pacific Northwest I spent my time exploring the woods, beaches, and tide pools. Every summer I reread Jack London's "The Sea Wolf", and Herman Melville's "Moby Dick." My first job was a as a deck hand on charter fishing boats out of Port Angeles. So, when Quartermaster Bernie Greene invited me aboard that day and told me stories with a sense of adventure, I signed onto the Rainer as an able-bodied seaman, and we headed to Alaska. That first voyage had me hooked and I joined NOAA Corps, leading to my current assignment as the Northwest scientific support coordinator...

100 Years of Service

-Hydro International (Article by Capt. Skip Theberge, NOAA Corps (ret.))

This year marks the 100th Anniversary of the Commissioned Corps of the National Oceanic and Atmospheric Administration (NOAA Corps). The law forming the service was signed on 22 May 1917 and overnight made the field officers of the then United States Coast and Geodetic Survey uniformed commissioned officers. Literally hundreds of hydrographers, topographers and geodesists have since served in this uniformed service. As such, a look back at the origins and history of this organisation is in order. Many elements of the National Oceanic and Atmospheric Administration (NOAA) and its commissioned officer service are direct descendants of the US Coast and Geodetic Survey (USC&GS), the oldest physical scientific agency in the US Federal Government. NOAA and the NOAA Corps can trace their lineage to 1807 when President Thomas Jefferson, among the most scientific of the United States presidents, signed a bill for the 'Survey of the Coast'...

VORTEX-Southeast research taking place in the air above the Tennessee Valley

-WHNT

HUNTSVILLE, Ala. - A group of severe weather researchers are back in the Tennessee Valley, and they have their eyes on the sky this spring. The Verification of the Origins of Rotation in Tornadoes Experiment-Southeast (or VORTEX-SE for short) is a collaborative effort coordinated by the National Severe Storms Laboratory and involves the Air Resources Laboratory, University of Alabama-Huntsville, Texas Tech University, Purdue University, University of Louisiana-Monroe, and many others. Vortex-SE is hoping to study the atmosphere within the first three miles above the ground, which means many of their instruments are up in the air -- literally...And believe it or not, NOAA Hurricane Hunters are up for the job of tornado chasing. They will fly no less than three thousand feet above the ground. But why fly an airplane into severe thunderstorms? "It's a heck of a radar platform, and we have that mobility," says Jack Parrish, who serves as a Flight Meteorologist onboard NOAA Hurricane Hunter aircraft. "A lot of other radars are stuck on the ground, they have to wait for the weather to come to them -- we go to the weather..."

100th Anniversary of the NOAA Corps

Celebrating a Century of Service on May 22 (1917-2017)

Faced with tough national security and economic challenges and a natural world governed by powerful and mysterious forces that often threatened life, property, and commerce, President Thomas Jefferson signed a bill creating a new federal agency in 1807 that would support the nation's defense, promote the well-being of its citizens, and unlock nature's secrets. The new agency's mission was to chart the nation's coastal waters to ensure that ships could move civilians, troops, and materiel safely.

During the next 150 years, that agency, the Survey of the Coast (later the Coast & Geodetic Survey or C&GS), would prove itself in war as well as in peacetime. With America's entry into the World War I, a commissioned service of the C&GS was formed in 1917 to ensure the rapid assimilation of C&GS technical skills for defense purposes. During World War II, officers and civilians of the C&GS produced nautical and aeronautical charts, provided critical geospatial information to artillery units, and conducted reconnaissance surveys.

Today, the work of the C&GS—and more—is conducted by the National Oceanic and Atmospheric Administration (NOAA) and the NOAA Commissioned Officer Corps—one of the seven uniformed services of the United States. The direct descendants of the C&GS, NOAA and the NOAA Corps work every day to keep the nation secure and productive by providing products and services that support maritime domain awareness; help ensure safe passage of commercial and military traffic on our nation's waterways; warn mariners, aviators, and the public of severe weather; aid search and rescue efforts; and conserve and protect our natural resources.

Continuing in the tradition of their C&GS predecessors, NOAA Corps officers continue to play a vital role in the acquisition and analysis of environmental data that aid NOAA and other agencies in meeting the national security, economic, and environmental challenges of the 21st century. NOAA Corps officers command ships that scan the seafloor for potential hazards to shipping, monitor oceanographic and atmospheric conditions, and study ocean resources. They also operate highly specialized aircraft that collect environmental and geographic data necessary for weather and flood prediction, nautical and aeronautical charting, disaster response, and resource management.

NOAA Basic Officer Training Class

Class 129 – Graduation is May 9 at the U.S. Coast Guard Academy

As part of the Officer Candidates' development, they wear specified shoulder board insignia according to their position. The Platoon Commander wears a shoulder board with four thin stripes, the Platoon Executive Officer and Platoon Guide wear three, Squad Leaders wear two, and the remaining members of the platoon wear one.
[Photo: NOAA]

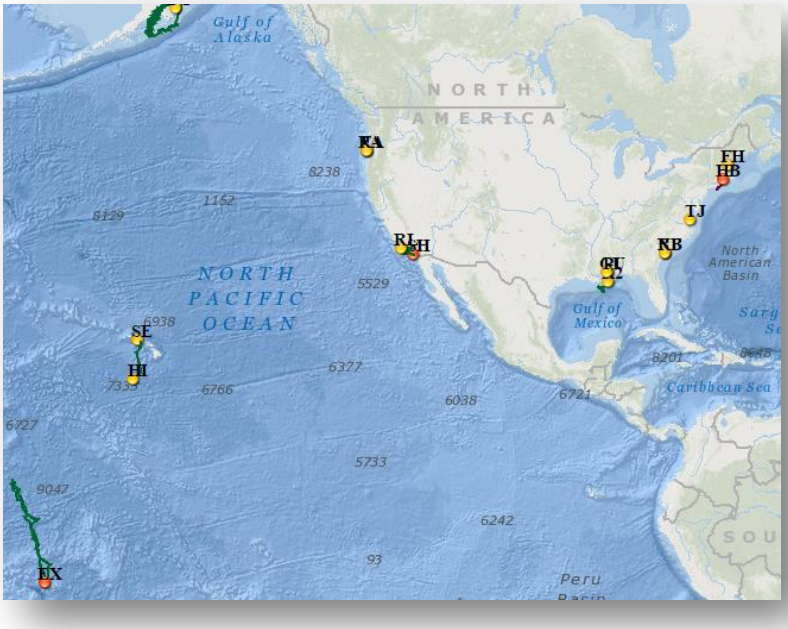
BOTC 129 is currently attending technical training at United States Maritime Resource Center (USMRC) in Middletown, Rhode Island. Specifically, they are studying radar theory, as well as learning practical applications of radar and the Automatic Radar Plotting Aid (APRA). The students have had a unique opportunity to integrate with refresher training (REFTRA) officers at USMRC, as both classes were undergoing training in the same facility.

Additionally, the students have completed Rules of the Road, a joint NOAA/Coast Guard course geared toward teaching future mariners the rules that have been established to prevent collisions at sea. The students dedicate significant time and effort to studying for this exam, as this is one of the most important concepts they will learn in their quest to become bridge watch officers.

Prior to departure for their stay in Middletown, the OCS 2-17/BOTC 129 students earned Senior Status. This phase of the program is geared toward preparing the Officer Candidates for serving as Junior Officers in the fleet. With Senior Status comes increased levels of responsibility, self-accountability, and program ownership; students are expected to uphold the highest standards of performance, as they will for the rest of their careers.

OMAO's Ships and Centers

OMAO's Ship Tracker (screen shot below) shows information about the location - present and past - of our fleet of research and survey ships. Please note: To access Ship Tracker you must create an account with a **.gov** or **.mil** email address. All other access is restricted.



OMAO's ships and related Marine Centers are listed below based on the geographical location of the vessels' homeports starting in the Northeast and ending in the Pacific.

New Castle, NH

NOAA Ship *Ferdinand R. Hassler*

Commanding Officer: LCDR Matthew Jaskoski

Primary Mission Category: Hydrographic Surveys

Ship status: Vessel will be in the U.S. Coast Guard Yard in Baltimore, Maryland for a maintenance period starting April 4 that will last through July. Through a Memorandum of Understanding with the Coast Guard Yard, repair work will address safety and performance items, including HVAC system modifications, cofferdam extensions, fast rescue boat davit wire rope renewal, and work boat boarding platform renewal.

NOAA Ship *Ferdinand R. Hassler's* twin hull design provides improved stability and positioning ability.
[Photo: David Hall/NOAA]

Newport, RI

NOAA Ship *Henry B. Bigelow*

Commanding Officer: CDR Jeff Taylor
Primary Mission Category: Fisheries Research
DEPART: Newport, Rhode Island **ARRIVE:** Newport, Rhode Island

Project: Spring Multispecies Bottom Trawl Survey
Objective: Determine the spring distribution and relative abundance of fish and invertebrate species found on the continental shelf and upper slope, including the collection of additional biological information following the pre-established sampling plan at the direction of the Chief Scientist. Opportunistically evaluate survey gear efficiency, methods, or survey related equipment that may benefit the trawl survey and fish stock assessments, and collect oceanographic data including conductivity temperature and depth casts and bongo tows at selected stations. Finally, collect acoustic data along cruise tracks with the EK-60 and ME-70 acoustic systems.

Davisville, RI

NOAA Ship *Okeanos Explorer*

Commanding Officer: CAPT Mark Wetzler
Primary Mission Category: Oceanographic Exploration and Research
DEPART Apia, Samoa **ARRIVE:** Pago Pago, American Samoa
DEPART: Pago Pago, Am. Samoa **ARRIVE:** Honolulu, Hawaii

Project: CAPSTONE
Objectives: CAPSTONE is a three year initiative to collect critical baseline NOAA science and management needs in largely unknown areas of U.S. waters in the Pacific. Operations conducted during this campaign support NOAA missions to understand and predict changes in climate, weather, oceans, and coasts, and share that knowledge and information with others. Much of the work associated with CAPSTONE will contribute to and complement Deep Sea Coral Research and Technology Program's three-year Pacific Islands Regional Initiative.

Norfolk, VA

NOAA Ship *Thomas Jefferson*

Commanding Officer: CDR Christiaan van Westendorp
Primary Mission Category: Hydrographic Surveys
Ship Status: Vessel will be in scheduled dry dock as well as alongside for scheduled maintenance, winter repairs, scientific data processing, crew rest, and training.

OMAO'S MARINE OPERATIONS CENTER – ATLANTIC (MOC-A)

CAPT Scott Sirois, Commanding Officer MOC-A

MOC-A serves as a homeport for one NOAA ship, and manages the day-to-day operations and provides administrative, engineering, maintenance, and logistical support for the research and survey ships in NOAA's Atlantic fleet. Each year, these ships conduct dozens of missions to assess fish and marine mammal stocks, conduct coral reef research, collect seafloor data to update nautical charts, and explore the ocean.

Charleston, SC

NOAA Ship *Nancy Foster*

Commanding Officer: Master Donn Pratt
Primary Mission Category: Oceanographic Research, Environmental Assessment
DEPART: Ponce, Puerto Rico **ARRIVE:** San Juan, Puerto Rico
DEPART: San Juan, Puerto Rico **ARRIVE:** St. Croix, U.S. Virgin Islands

Project 1: Mapping Essential Fish Habitat in the U.S. Caribbean to inform Marine Protected Area Management
Objectives: Scientists will collect a multibeam bathymetry dataset with 100% seafloor ensonification, along with multibeam backscatter suitable for seafloor characterization. Fishery acoustics data will be collected to characterize broad-scale fish abundance, biomass, and utilization patterns, as well as to locate and document fish spawning aggregations. Multibeam data will be collected to conform to IHO Order 1 (<100m) and Order 2 (>100m) accuracy standards. The strategies developed for each survey area will take into account the minimum depths, general bathymetry, and time allotment. The delineation and identification of seafloor habitats will be assisted by the use of a moderate-depth Remotely Operated Vehicle (ROV). The vehicle has video and frame camera capability to depths of 300 meters and will be used for transect sampling within areas mapped during this mission.

Project 2: Coral Reef Ecosystem Research
Objectives: Scientists will sample water properties, currents, dispersal, and transport of fish larvae in the Virgin Islands and neighboring regions. Results from the survey can enhance understanding of regional spatial variation and determine the levels of exchange of offshore waters onto the shelf break (e.g. between St. Croix and the islands on the shelf) and the biological supply (fish larvae) between managed and non-managed areas, as well as insights into the relative importance of Grammanik Bank as a source of juvenile fishes recruiting to the waters of the Virgin Islands.

NOAA Ship *Ronald H. Brown*

Commanding Officer: CAPT Robert Kamphaus
Primary Mission Category: Oceanographic Research, Environmental Assessment
Depart: Charleston, South Carolina **Arrive:** Cristobal, Panama

Project: Stratus
Objectives: The ship will support recovery and redeployment of the Stratus Ocean Reference Station (ORS) in the region of persistent marine stratocumulus clouds off northern Chile at 20°S, 85°W; overlapping the deployments of the old and new Stratus moorings to support intercalibration and merging of the old and new data records; collection of shipboard data near the old and new Stratus moorings to perform end of deployment and beginning of deployment calibrations; collection of data during underway and on station shipboard oceanographic and meteorological sampling; deployment of surface drifting buoys for NOAA's Atlantic Oceanographic & Meteorological Laboratory (AOML); and deployment of profiling Argo floats for the international Argo program.

CAPT Robert Kamphaus addresses guests at a ceremony on March 27 in Charleston, South Carolina, to recognize the ship's crew on their record-breaking 1,347-day deployment away from home.

A special thanks to Senator Tim Scott (R-SC) who provided a letter of greeting that was read during the ceremony to welcome the ship and her crew home.

[Photo: David Hall/NOAA]

Pascagoula, MS

NOAA Ship *Pisces*

Commanding Officer: CDR Nicholas Chrobak
Primary Mission Category: Fisheries Research
Depart: Pascagoula, Mississippi **Arrive:** Galveston, Texas
Depart: Galveston, Texas **Arrive:** Pascagoula, Mississippi

Project: SEAMAP Reef Fish Video
Objectives: The ship will conduct a survey of reef fish on the U.S. continental shelf of the Gulf of Mexico using a custom built stereo/video camera system and bandit reels. The ship's ME70 multibeam system and Simrad EK60 echosounder will be used to map predetermined targeted areas on a nightly basis to improve or increase the reef fish sample universe.

NOAA Ship *Gordon Gunter*

Commanding Officer: LCDR Lindsay Kurelja
Primary Mission Category: Fisheries Research
Ship Status: Vessel will be in scheduled dry dock as well as alongside for scheduled maintenance, winter repairs, scientific data processing, crew rest, and training.

NOAA Ship *Oregon II*

Commanding Officer: Master Dave Nelson
Primary Mission Category: Fisheries Research
Depart: Pascagoula, Mississippi **Arrive:** Pascagoula, Mississippi
Depart: Pascagoula, Mississippi **Arrive:** Pascagoula, Mississippi

Project 1: Experimental Longline Survey
Objectives: Test the effects of variable gear types under controlled experimental conditions on catch rates of teleost and elasmobranch fishes in the northern Gulf of Mexico. GoPro video cameras equipped with lasers attached to the longline mainline will provide an additional means of monitoring selectivity. An additional objective of the experimental survey is to explore depths outside of the annual NMFS MS Labs Shark/Red Snapper bottom longline survey.

San Diego, CA

NOAA Ship *Reuben Lasker*

Commanding Officer: CDR Kurt Dreflak
Primary Mission Category: Fisheries Research
Depart: San Francisco, California **Arrive:** San Francisco, California
Depart: San Francisco, California **Arrive:** San Francisco, California

Project 1: Coastal Pelagic Species Spring Survey
Objectives: Survey the distributions and abundances of coastal pelagic fish stocks, their prey, and their biotic and abiotic environments in the California Current between San Diego, California and Cape Mendocino, California. The survey domain encompasses the anticipated distribution of the central sub-population of Northern anchovy (*Engraulis mordax*). The modeled distribution of Pacific sardine (*Sardinops sagax*) potential habitat, and any information recently gathered from other research projects or the fishing industry (e.g. sardine bycatch) will be used to determine whether the survey domain also encompassed the expected distribution of sardine.

Project 2: Rockfish Recruitment and Ecosystem Assessment
Objectives: Sample for pelagic juvenile rockfish (*Sebastes* spp.) and other epi-pelagic micronekton off California and characterize prevailing ocean conditions and examine prominent hydrographic features.

Newport, OR

NOAA Ship *Rainier*

Commanding Officer: CDR John Lomnicky
Primary Mission Category: Hydrographic Surveys
Depart: Newport, Oregon **Arrive:** Kodiak, Alaska
Depart: Kodiak, Alaska **Arrive:** Kodiak, Alaska

Project 1: Puget Sound, Washington
Objectives: To support safe navigation through the acquisition and processing of hydrographic survey data for updating nautical charts and by the identification and dissemination of dangers to navigation as identified during the course of survey operations.

Project 2: Woody Island to Afognak
Objectives: To support safe navigation through the acquisition and processing of hydrographic survey data for updating nautical charts and by the identification and dissemination of dangers to navigation as identified during the course of survey operations.

NOAA Ship *Bell M. Shimada*

Commanding Officer: CDR Paul Kunicki
Primary Mission Category: Fisheries Research
DEPART: San Diego, California **ARRIVE:** San Francisco, California
DEPART: San Diego, California **ARRIVE:** San Francisco, California

Project 1: Spring CalCOFI
Objectives: Survey the distributions and abundances of pelagic fish stocks, their prey, and their biotic and abiotic environments in the area of the California Current between San Francisco, California and San Diego, California.

Project 2: Patterns in Deep Sea Coral and Sponge Communities
Objectives: To fill existing gaps in high resolution bathymetry data utilizing the ME70 and the Coast Survey mapping AUV to complement vessel acquired data as well as provide more highly resolved data over features of interest (e.g. maritime heritage sites) identified during the mission; to simultaneously acquire water column data indicating the presence, relative abundance, and distribution of fishes associated with various seafloor features utilizing the EK60; to explore, identify, characterize, and assess fish and deep sea coral communities utilizing an ROV; and to capitalize on this opportunity to educate the local community about sanctuary resources and the pressures they face.

OMAO'S MARINE OPERATIONS

CAPT Todd Bridgeman, Director of Marine Operations
OMAO's Marine Operations oversees operations of the three regional Centers, including the Marine Operations Center-Pacific, Marine Operations Center-Atlantic, and Marine Operations Center-Pacific Islands.

OMAO'S MARINE OPERATIONS CENTER – PACIFIC (MOC-P)

CDR Brian Parker, Commanding Officer MOC-P
MOC-P serves as a homeport for two NOAA ships, and manages the day-to-day operations and provides administrative, engineering, maintenance, and logistical support for the research and survey ships in NOAA's Pacific fleet. Each year these ships conduct dozens of missions to assess fish and marine mammal stocks, conduct coral reef research, collect seafloor data to update nautical charts, and explore the ocean.

Civilians and NOAA Corps officers at NOAA's MOC-P commemorate the 100th anniversary of the NOAA Corps.
[Photo: Beverly Parker/NOAA]

Ketchikan, AK

NOAA Ship *Fairweather*

Commanding Officer: CDR Mark Van Waes
Primary Mission Category: Hydrographic Surveys

DEPART: Newport, Oregon **ARRIVE:** Ketchikan, Alaska

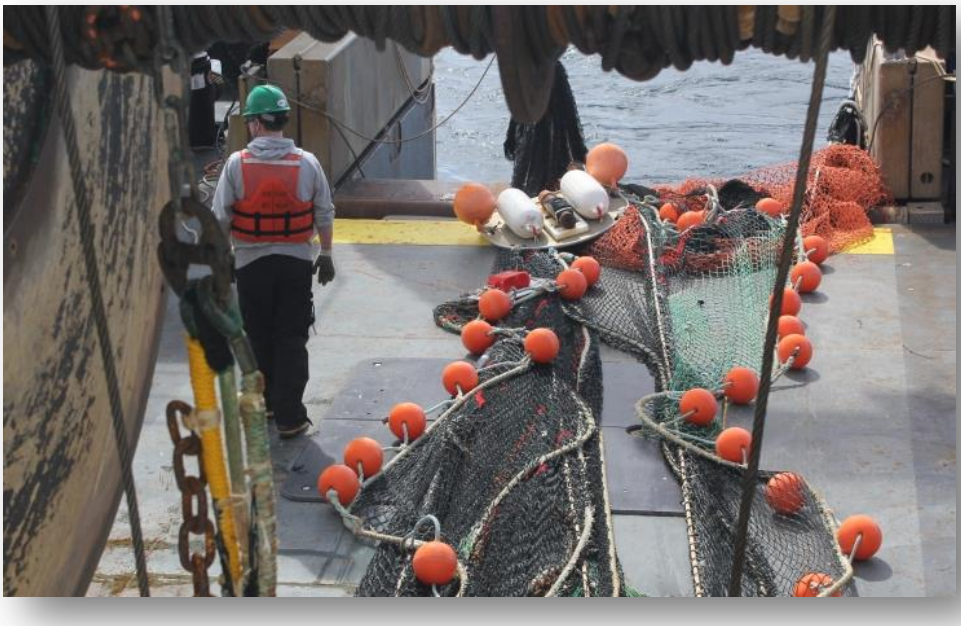
Project: West Prince of Wales Island
Objective: To support safe navigation through the acquisition and processing of hydrographic survey data for updating nautical charts and by the identification and dissemination of dangers to navigation as identified during the course of survey operations.

Kodiak, AK

NOAA Ship *Oscar Dyson*

Commanding Officer: CDR Michael Levine
Primary Mission Category: Fisheries Research
DEPART: Kodiak, Alaska **ARRIVE:** Dutch Harbor, Alaska

Project 1: EcoFOCI Spring Mooring Cruise
Objectives: This project is intended to recover and deploy subsurface moorings in Chiniak Bay and the Sanak Trough in the Gulf of Alaska, as well as in the Bering Sea.



Crew on *Oscar Dyson* prepare to deploy the trawl net on the back deck while the ship adjusts its heading based on the wind and sea conditions.
[Photo: LT Colin Kliewer/NOAA]

Honolulu, HI

NOAA Ship *Hi'ialakai*

Commanding Officer: CAPT Elizabeth Kretovic
Primary Mission Category: Oceanographic Research, Environmental Assessment
DEPART: Pearl Harbor, Hawaii **ARRIVE:** Guam, Marianas Islands
DEPART: Guam, Marianas Islands **ARRIVE:** Saipan, Marianas Islands

Project: Marianna Archipelago Reef Assessment and Monitoring Program (MARAMP)
Objectives: MARAMP is a component of an integrated coral reef ecosystem assessment led by the Coral Reef Ecosystem Program (CREP) of the Pacific Islands Fisheries Science Center (PIFSC) in some 50 U.S.-affiliated Pacific Islands. This comprehensive, multi-agency research and education effort is sponsored by NOAA's Coral Reef Conservation Program (CRCP), a partnership between the National Marine Fisheries Service, National Ocean Service, and other NOAA agencies with the objective of improving understanding and management of coral reef ecosystems.

NOAA Ship *Oscar Elton Sette*

Commanding Officer: CDR Donald Beaucage
Primary Mission Category: Fisheries Research
DEPART: Pearl Harbor, Hawaii **ARRIVE:** Pearl Harbor, Hawaii
DEPART: Pearl Harbor, Hawaii **ARRIVE:** Pearl Harbor, Hawaii

Project 1: Leeward Oahu Pelagic Ecosystem Characterization
Objectives: Perform a midwater trawl and bongo net survey to compare to a series of trawl and bongo net surveys from 1967-1978 off leeward Oahu, henceforth referred to as the baseline surveys. The baseline surveys estimated fish composition and abundance for 4 different components of the pelagic community, notably the mesopelagic fish assemblage shorefish larvae, tuna larvae, as well as a suite of zooplankton taxa from 2 forage availability studies. Comparison of current composition and abundances to the baseline composition and abundances after nearly 50 years will be a valuable scientific finding to ascertain how the pelagic ecosystem has changed, or not, over that extended time period. The sampling gear used in the baseline surveys from 1967-1978 are Isaacs-Kidd midwater trawl (IKMT), Cobb trawl, and 70cm bongo nets. The second primary component of LOPEC on SE17-03 is to establish a time series of micronekton and plankton for the leeward Oahu area for ecosystem monitoring. Some operations from the baseline comparison component will be part of the new time series with additional surveys of plankton using other sampling gear such as ring nets and other configurations (different mesh sizes) of bongo nets during both the daytime and the nighttime.

Project 2: West Hawaii Integrated Ecosystem Assessment
Objectives: The scientific objectives of this cruise are to collect information to describe the physical, chemical, and biological oceanographic environment with a particular emphasis on the deep-sea micronekton community and ocean surface slicks.

OMAO'S MARINE OPERATIONS CENTER – PACIFIC ISLANDS (MOC-PI)

CDR Matthew Wingate, Commanding Officer MOC-PI
MOC-PI serves as a homeport for two NOAA ships, and manages the day-to-day operations and provides administrative, engineering, maintenance, and logistical support for the ships in NOAA's Pacific Islands fleet.

OMAO's Aircraft

Tampa, Florida

WP-3D (N42RF) – "Hurricane Hunter"

Temporary Base: Huntsville, Alabama
Current Mission: VORTEX-SE through April

The VORTEX-SE project assesses the formation, intensity, and path of tornadoes in the Southeast U.S. region. The overarching goal of VORTEX-SE is to reduce damage, injuries, and loss of life from tornadoes through improvements in understanding, forecasting and warning, and risk communication in ways that support protective decision making.

WP-3D (N43RF) – "Hurricane Hunter"

Temporary Base: Jacksonville, Florida
Current Mission: Scheduled Maintenance

The aircraft was inducted into re-winging on March 15. No additional projects are planned on this airframe until re-wing is complete in summer 2018.

Gulfstream IV (N49RF) – "Hurricane Hunter"

Current Mission: Equipment Installation

The aircraft will have equipment installed in preparation for the 2017 hurricane season.

Jet Prop Commander (N45RF)

Temporary Base: Various Locations
Current Mission: Snow Survey

This aircraft is supporting the snow survey mission, using specialized detection equipment to make accurate, real-time measurements of snow water content across the country. This information is critical for managers and others to make optimal decisions supporting river, flood, and water supply forecasting, agriculture and forest management, recreation and winter tourism, and the commerce, industry, and transportation sectors of the Nation's economy.

Twin Otter (N46RF)

Temporary Base: Various Locations
Current Mission: Snow Survey and Southeast AMAPPS

NOAA aircraft use specialized detection equipment to make accurate, real-time measurements of soil moisture content across the country. This information is critical for managers and others to make optimal decisions supporting river, flood, and water supply forecasting, agriculture and forest management, recreation and winter tourism, and the commerce, industry, and transportation sectors of the Nation's economy. The benefits of accurate soil moisture measurements are immense and NOAA aircraft are uniquely capable to provide this information.

The aircraft will be supporting the NMFS Atlantic Marine Assessment Program for Protected Species (AMAPPS) project on the east coast of the U.S. This survey helps to develop models and tools to provide seasonal density estimates incorporating habitat characteristics of marine mammals, turtles, and seabirds in the western North Atlantic Ocean. The project will provide data essential to supporting conservation initiatives mandated under the National Environmental Policy Act (NEPA), Marine Mammal Protection Act (MMPA), Migratory Bird Treaty Act (MBTA), and Endangered Species Act (ESA).

Twin Otter (N48RF)

Temporary base: Various Locations
Current Mission: Snow Survey

NOAA aircraft use specialized detection equipment to make accurate, real-time measurements of soil moisture content across the country. This information is critical for managers and others to make optimal decisions supporting river, flood, and water supply forecasting, agriculture and forest management, recreation and winter tourism, and the commerce, industry, and transportation sectors of the Nation's economy. The benefits of accurate soil moisture measurements are immense and NOAA aircraft are uniquely capable to provide this information.

Twin Otter (N56RF)

Temporary base: Hyannis, Massachusetts
Current Mission: Northeast Right Whales

North Atlantic right whales are critically endangered and listed under the Marine Mammal Protection Act. Aerial surveys serve multiple objectives with regard to conservation including providing locations and distribution of right whales to mariners to avoid collisions with ships, photo identification records on right whales, information on distribution and abundance of marine mammals and turtles, and provide sightings of dead whales for monitoring mortality.

Twin Otter (N57RF)

Temporary base: Various Locations
Current Mission: Coastal Mapping LiDAR

The TopoBathy Lidar mission will collect data in the coastal zone used to produce the most up-to-date and accurate marine navigation charts, FEMA flood plain and inundation maps, and other Integrated Ocean and Coastal Mapping (IOCM) applications. Data gathered will help ensure safe and efficient marine transportation, benefit coastal communities with accurate resource management, and aid emergency response efforts.

King Air (N68RF)

Temporary Base: Various locations
Current Mission: Continuous Coastal Mapping

Coastal mapping is an on-going mission of NOAA's National Geodetic Survey (NGS) to survey approximately 95,000 miles of U.S. coastline providing the Nation with an accurate, up-to-date and seamless database of the national shoreline. This data is used as the baseline for defining America's marine territorial limits, including its Exclusive Economic Zone, and for the geographic reference needed to manage coastal resources and support marine navigation. Stereo photogrammetry and LiDAR are used to produce a digital database. In addition, the Coastal Mapping Program supports NOAA's homeland security and emergency response requirements by rapidly acquiring and disseminating a variety of datasets to federal, state, and local government agencies as well as the general public.

OMAO'S AIRCRAFT OPERATIONS CENTER (AOC)

CAPT Michael Silah, Commanding Officer AOC

The AOC, located at MacDill Air Force Base in Tampa, Florida, serves as the main base for OMAO's fleet of nine aircraft and provides capable, mission-ready aircraft and professional crews to the scientific community. Whether studying global climate change or acid rain, assessing marine mammal populations, surveying coastal erosion, investigating oil spills, flight checking aeronautical charts, or improving hurricane prediction models, the AOC flight crews continue to operate in some of the world's most demanding flight regimes.

Construction of the new hangar to house the NOAA Aircraft Operations Center at Lakeland Linder Regional Airport.
[Photo: Brad Lunz/Lunz Group]

NASA Global Hawk

Location: Edwards Airforce Base
Mission: Scheduled Inspection and Maintenance

NASA's 872 Global Hawk has completed the install of a new INMARSAT command and control communications system and the related update is occurring in the mobile ground control station. INMARSAT communications testing will be conducted in April. NASA 872 is preparing to support a DoD project's systems ground and flight tests in the spring, followed by mission flights in the Fall. NASA 872 will also support science missions this summer as part of a NASA project to train new engineers through preparing and executing flights against cyclonic storms in the Pacific, Gulf, Caribbean, and Atlantic regions.

NASA 874 is currently undergoing refurbishment. It is expected to complete systems reintegration this spring, followed by ground tests and a Functional Check Flight by the beginning of 2018.

Mission plans and FAA Certificate of Waiver of Authorizations (COAs) are in process to support the fall 2017 missions as well as groundwork for potential flights to the Arctic for a joint NOAA/NASA project (Arctic Domain) proposed for 2018. Global ARCHER planning is being conducted on a weekly basis as a result of the NOAA Arctic Domain meetings that occurred in early February.

APH-22 Hexacopter

Location: Bellows Air Force Station, Hawaii
Mission: APH-22 Training

The Pacific Islands Fisheries Science Center (PIFSC) utilizes the airfield at Bellows Air Force Station on the island of Oahu to conduct training and proficiency flights. This allows APH-22 operators to maintain proficiency for future operations at a reduced cost.

Location: Atlantic Northeast
Mission: Emergency Response Turtles and Seals

The North East Fisheries Science Center (NEFSC) seeks to use the APH-22 hexacopter to respond to entanglements and other unplanned situations involving marine mammals. Photographs will be collected for the purpose of aiding emergency stranding response, event documentation, and photo ID. Unmanned Aerial System (UAS) technologies will also be used to conduct surveys for marine turtles. The intent is to assess the feasibility of using small unmanned rotorcraft to search for turtles in their marine environment both at surface and subsurface. Turtles that are discovered either by the APH-22 or by on-vessel observers will be photographed by the APH-22 and then tagged and or sampled as part of an ongoing study. Turtles may be photographed post-release with the APH-22 to document post-release behavior. NEFSC will also use the APH-22 to conduct surveys of seal haul out sites. Photographs will be collected for the purpose of obtaining local population numbers, documenting seals with evidence of fishery interactions, and collecting photo ID data of seals with brands, wounds, and other distinguishing marks.

Location: Florida and Georgia Coastal Waters
Mission: Right Whale Photogrammetry

NEFSC seeks to utilize the APH-22 airframe to obtain right whale aerial photography and collect blow samples. Vessel surveys will be conducted in the near coastal waters of Georgia and northeast Florida during the winter calving season for North Atlantic right whales. This project is in collaboration with the Southeast Fisheries Science Center (SEFSC) and Woods Hole Oceanographic Institute (WHOI). Flight crews will maintain an altitude of at least 100 vertical feet over whales for photogrammetry measurements. If an injured or entangled whale is encountered, UAS operators are permitted to descend to 50 feet for more detailed images. The permit allows for descent to 10 feet in order to collect blow (breath) samples.

Location: Seattle, Washington
Mission: Sand Point APH-22 Training
The Marine Mammal Laboratory (MML) intends to begin training flights in the Sand Point area in Seattle, WA. MML has several objectives for the use of the APH-22 hexacopter unmanned aircraft system throughout Alaska. These trips tend to occur in the summer and sometimes fall seasons. In between surveys in the field, it is important that pilots maintain . The Sand Point location will significantly reduce the travel time required and provide more opportunities to meet training requirements.

Location: Cape Cod, Massachusetts
Mission: Large Whale Assessment
This collaboration between the Southwest Fisheries Science Center (SWFSC), NEFSC and WHOI will continue to use the APH-22 for large whale photogrammetry and health assessment in the Cape Cod Bay and off the coast of New England. Aerial images and blow samples from the whales will be captured by the hexacopter when whales are at the surface. Measurements will be made from photographs using an onboard pressure altimeter to estimate scale, and altitude estimates will be calibrated using images of the support vessel.

Location: San Simeon, California
Mission: Gray Whale Survey
SWFSC seeks to utilize the APH-22, APH-17 AND APO-42 airframes to survey Gray Whales from Piedras Blancas Lighthouse near San Simeon, CA. The objective of this study is to assess the body condition and nutritional status of reproductive female gray whales based on measurements of length and width from vertical aerial photographs collected using a UAS. Estimates of length will inform long-term growth trends and minimum size at sexual maturity for this population. Widths will be used to infer current nutritional status and to establish a baseline of condition for reproductive females within this population. These metrics will be compared to those from samples collected from manned platforms in previous years and data collected during scientific whaling operations in the late 1950s and 1960s. These datasets will also inform us on how changes in the Arctic are impacting this population of large whales. It is expected that this sampling will become part of the annual survey of northbound gray whale cow/calf pairs from the Piedras Blancas Light Station.

Location: La Jolla, California
Mission: Flight Training from a Small Boat
SWFSC Advanced Survey Technology group, seeks to conduct launch and recovery training of the APH-22 Hexacopter from a small boat. The goal of these training flights is to allow the APH-22 Hexacopter Pilot in Command and ground station operator to practice the launch and recovery procedures prior to research operations.

Location: California Coast
Mission: Conformation of Coastal Pelagic Species
UAS missions will occur during project RL-17-02 onboard the NOAA Ship *Reuben Lasker* from April 11 through April 22, 2017. APH-22 Hexacopter flights may occur up to 4 times per day as adjustments are made to launch and recovery procedures and various weather conditions. Flights will typically occur from one mile before the landward end of the acoustic survey line to the shore. The APH-22 Hexacopter flights will be conducted on schools seen on sonar imagery to determine reactions to the vessel. This will allow the science team to assess the operational limits of the APH-22 Hexacopter in terms of imagery, and the coordination limits for operating the APH-22 Hexacopter from the NOAA Ship *Reuben Lasker*. Flights will also occur from a small boat launched from the NOAA Ship *Reuben Lasker*.

APH-17 Hexacopter / APH-22 Hexacopter / APO-42 Octocopter

Location: Descanso Ranch, California
Mission: Test Flights and Training

SWFSC seeks to utilize the Descanso Ranch in Jamul, California as testing grounds for the APH-17 Hexacopter, APH-22 Hexacopter, and APO-42 Octocopter. Descanso Ranch is an ideal testing facility due to its Class-G airspace designation and its open flight area which is devoid of trees and other vertical obstructions. In addition, the entire ranch is government owned property and is surrounded by a fence with a secure gate. Testing and training activities with the UAS platforms will include flight maneuvers, take-off and landing drills, aerial mapping, and photogrammetry.

MD4-1000/DJI S-1000

Location: Corryton, Tennessee
Mission: Training and Operational Development

NOAA's Air Resources Laboratory, Atmospheric Turbulence and Diffusion Division (ATDD) seeks to utilize the NOAA National Marine Fisheries Center for Cooperative Unmanned Technologies (CCUT) MD4-1000 and DJI S-1000 airframes to perform instrument testing to verify its performance prior to the upcoming VORTEX-SE 2017 field study. Two iMet-XQ temperature/pressure/relative humidity sensors will be flown on the MD4-1000 for inter-comparison with the existing DJI S-1000 platform.

Location: Bella Mina, Alabama
Mission: Measure Convective Initiation in the Lower boundary layer.

NOAA's ATDD will utilize a DJI-S1000 to measure the conditions that lead to convective initiation (CI) in the lower boundary layer in Northern Alabama. The goal is to measure the scale and extent of the temperature and moisture fields in the lower boundary layer adjacent to fixed towers on the surface. The mission will be flown over Auburn University's Tennessee Valley Research and Extension Center in Belle Mina, AL using ATDD's existing COA 2015-ESA-106 and COA 2015-ESA-200 for this area. Additionally, the mission will be flown over Auburn University's Northern Alabama Horticultural Research Centerin Cullman, Alabama using the FAA-NOAA Memorandum of Agreement. ATDD's DJI S-1000 will also be utilized to perform storm damage assessment over a large area of Northern Alabama. The visible and near infrared cameras will be used to document storm damage to assist the National Weather Service with determining the category of any tornado activity in the area that occurs during the VORTEX SE intensive study periods. These flights will be performed after all severe thunderstorm and/or tornado activity has subsided.

MD4-1000/ SenseFly eBee RTK

Location: Camarillo, California – California State University Channel Islands
Mission: Training and Operational Development

California State University Channel Islands and NOAA's Collaborative Center for Unmanned Technologies have signed a Memorandum of Agreement to partner on the use of UAS for research and monitoring of the Channel Islands, and have agreed to provide access to a training field and support facilities.

SenseFly eBee RTK

Location: Alpena, MIichigan
Mission: Shallow Water Surveys and Mapping

The Thunder Bay National Marine Sanctuary will be conducting a multi-partner UAS project; the eBee RTK will be used to survey nearshore areas along the Lake Huron coast. A local non-profit will be conducting offshore surveys utilizing vessel-launched quadcopters.

OMAO Partnerships

United States Senate Committee on Commerce, Science, and Transportation

Location: Washington, District of Columbia
Detail: LCDR Wendy Lewis, NOAA Commissioned Officer Corps

LCDR Lewis is currently on detail to the Committee with the staff of the Chair, Senator John Thune (R-SD), where she is assisting on activities pertaining to oceans, atmosphere, and fisheries policy, as well as other matters within the Committee's jurisdiction.

National Science Foundation

Location: South Pole, Antarctica
Mission: LTJG Gavin Chensue, NOAA Commissioned Officer Corps

Members of the NOAA Commissioned Officer Corps carry out NOAA's mission in remote locations across the globe. LTJG Chensue is assigned to Antarctica where he serves as the Station Chief for NOAA’s Atmospheric Research Observatory (ARO) at the Amundsen-Scott South Pole Station. The ARO at the Amundsen-Scott South Pole Station is a National Science Foundation facility used in support of scientific research related to atmospheric phenomena.

Department of Defense - U.S. Pacific Command (USPACOM)

Location: Honolulu, Hawaii
Embedded Liaison: CAPT Barry Choy, NOAA Commissioned Officer Corps

The U.S. Pacific Command (USPACOM) area of responsibility encompasses approximately half the earth's surface and more than half of its population. The 36 nations that comprise the Asia-Pacific include: two of the three largest economies and nine of the ten smallest; the most populous nation; the largest democracy; the largest Muslim-majority nation; and the smallest republic in the world. The region is a vital driver of the global economy and includes the world's busiest international sea lanes and nine of the ten largest ports. By any meaningful measure, the Asia-Pacific is also the most militarized region in the world, with seven of the world's ten largest standing militaries and five of the world's declared nuclear nations. Under these circumstances, the strategic complexity facing the region is unique. CAPT Choy is linked closely with the activities within the region allowing for identification of opportunities and cooperation between USPACOM and NOAA, and better overall government function situational awareness in the region.

Department of Defense - U.S. Navy

Location: Washington, DC
Embedded Liaison: LCDR Jason Mansour, NOAA Commissioned Officer Corps

LCDR Jason Mansour serves as NOAA liaison to the Oceanographer of the Navy and is an important interface between the U.S. Navy and other U.S. federal agencies, including NOAA. As NOAA Liaison, LCDR Jason Mansour serves as the Head of the Interagency Policy Branch of the International and Interagency Policy Division, Office of the Oceanographer of the Navy, located at the U.S. Naval Observatory. The mission of this Division is to coordinate and execute the Oceanographer of the Navy functions related to policy and programs involving international and/or interagency oceanography. Oceanography includes meteorology, oceanography, mapping, charting and geodesy, astronomy, and precise time, and time interval.

Location: Stennis Space Center, Mississippi
Embedded Liaison: LTJG Laura Dwyer, NOAA Commissioned Officer Corps

Embedded in the Navy’s Naval Oceanography Mine Warfare Center, LTJG Laura Dwyer works side by side with Navy officers operating Unmanned Underwater Vehicles worldwide and is currently stationed at Stennis Space Center. This collaboration will provide knowledge and experience that will keep NOAA on the cutting edge of this emerging technology as well as strengthen the partnership between NOAA and the Navy.

Department of Homeland Security - U.S. Coast Guard

Location: Washington, DC

Embedded Liaison: CDR G. Mark Miller, NOAA Commissioned Officer Corps

As the NOAA liaison to the United States Coast Guard (USCG), CDR Miller maintains a current and comprehensive knowledge of interagency activities and policies related to the USCG and NOAA. He identifies potential conflicts or benefits issues for analysis and evaluation, conducts appropriate assessments and studies, and serves as the interface between NOAA and the USCG. CDR Miller initiates, designs, and implements strategies through federal agency liaison and coordination that results in cooperative arrangements for maritime security, oceanographic research, hazardous materials spill response, and many other activities.

Teacher at Sea Program

The mission of the Teacher at Sea (TAS) program is to give teachers a clearer insight into our ocean planet, a greater understanding of maritime work and studies, and to increase their level of environmental literacy by fostering an interdisciplinary research experience. The program provides a unique environment for learning and teaching by sending kindergarten through college-level teachers to sea aboard NOAA research and survey ships to work under the tutelage of scientists and crew. Then, armed with new understanding and experience, teachers bring this knowledge back to their classrooms. Since its inception in 1990, the program has enabled more than 800 teachers to gain first-hand experience of science and life at sea. By participating in this program, teachers enrich their classroom curricula with knowledge that can only be gained by living and working side-by-side, day and night, with those who contribute to the world's body of oceanic and atmospheric scientific knowledge. Please access former teacher at sea blogs which document their missions at sea and offer a wealth of information about the research being conducted as well as personal stories.

- Teacher at Sea Emily Sprowls (Harmony School, Bloomington, IN) will sail on an Experimental Longline Survey in and out of Pascagoula, MS, on NOAA Ship *Oregon II.*
- Teacher at Sea Chris Tait (New Fairfield Public Schools, New Fairfield, CT) will sail on the Anchovy/Sardine Spring survey from San Diego, CA, to San Francisco, CA, on NOAA Ship *Reuben Lasker.*
- Teacher at Sea Karen Grady (Lavaca School District, Lavaca, AR) will sail on an Experimental Longline Survey in and out of Pascagoula, MS, on NOAA Ship *Oregon II*.

The **2017 Field Season** is underway with 31 teachers currently scheduled to go to sea. To learn about the teachers, read their blogs, and more, please visit http://teacheratsea.noaa.gov/#/2017/.

Teacher at Sea Emily Sprowls participates in pre-cruise abandon ship drill aboard NOAA Ship *Oregon II*.
[Photo: NOAA]

OMAO - NOAA Dive Program

OMAO manages and implements NOAA's Dive Program (NDP), which trains and certifies scientists, engineers, and technicians from federal, state, tribal governments, and the private sector to perform the variety of tasks carried out underwater to support NOAA's mission. NDP also has cooperative diving agreements with over 100 government agencies and academic institutions. NOAA has more than 400 divers who perform over 14,000 dives per year. The NDP is headquartered at the NOAA Diving Center at the NOAA Western Regional Center in Seattle, Washington.

Divemaster candidate in training assists a diver that has just finished a dive on the AGA full face mask.

[Photo: Greg McFall/NOAA]

OMAO Small Boat Program

OMAO manages NOAA's Small Boat Program and sets policy and provides safety inspections for almost 400 small boats operated by the various Line and program offices throughout NOAA, which support fisheries laboratories, dive support, nautical charting, ocean and Great Lakes research, and more.

NOAA small boats support many diverse operations across the country.
[Photos: NOAA]

Office of Marine and Aviation Operations

Providing Environmental Intelligence for a Dynamic World

The personnel, ships, and aircraft of NOAA play a critical role in gathering environmental data vital to the nation's economic security, the safety of its citizens, and the understanding, protection, and management of our natural resources. The NOAA fleet of ships and aircraft is managed and operated by the Office of Marine and Aviation Operations (OMAO), an office comprising civilians, mariners, and officers of the NOAA Commissioned Officer Corps, one of the seven uniformed services of the United States. NOAA's roots trace back to 1807, when President Thomas Jefferson ordered the first comprehensive coastal surveys. Those early surveys ensured safe passage of ship-borne cargo for a young nation. As the needs of the nation have grown, so too have OMAO's responsibilities. Today, OMAO civilians and NOAA Corps officers operate, manage, and maintain NOAA's active fleet of 16 research and survey ships and nine specialized aircraft. Together, OMAO and the NOAA Corps support nearly all of NOAA's missions.

NOAA has the largest fleet of federal research and survey ships in the nation. The fleet ranges from large oceanographic ships capable of exploring and charting the world's deepest ocean, to smaller vessels responsible for surveying the shallow bays and inlets of the United States. The fleet supports a wide range of marine activities including fisheries surveys, nautical charting, and ocean and climate studies. Based throughout the continental United States, Alaska, and Hawaii, the ships operate in all regions of the nation and around the world.

NOAA's aircraft provide a wide range of airborne capabilities. Our highly specialized Lockheed WP-3D aircraft are equipped with an unprecedented variety of scientific instrumentation, radars, and recording systems for both in situ and remote sensing measurements of the atmosphere, the Earth, and its environment. Equipped with both C-band weather radar and X-band tail Doppler radar systems, the WP-3Ds have the unique ability to conduct tropical cyclone research in addition to storm reconnaissance. Together with NOAA's Gulfstream IV-SP jet, these ‘hurricane hunter’ aircraft greatly improve our physical understanding of hurricanes and enhance the accuracy of tropical cyclone forecasts. NOAA's light aircraft also play a vital role in monitoring our environment. Our King Air, Turbo Prop Commander, and Twin Otter aircraft support marine mammal population studies, shoreline change assessments, oil spill investigations, and water resource/snowpack surveys for spring flood forecasts.

The NOAA fleet provides immediate response capabilities for unpredictable events. For example, In October 2016, NOAA's WP-3D (N43RF) and G-IV (N49RF) conducted 21 operational missions in seven days into Hurricane Matthew gathering vital data used to improve hurricane track and intensity forecasts. Rapid response by NOAA Ship *Ferdinand R. Hassler* to survey for underwater debris and shoaling that could prove dangerous to deeper draft vessels expedited the opening of the Ports of Charleston and Savannah by the U.S. Coast Guard following the passage of Hurricane Matthew. After the storm, NOAA's King Air (N68RF) flew 14 missions to collect post-storm damage and flooding imagery from Florida to Virginia in coordination with FEMA.

While manned aircraft and sea-going vessels have been, and will continue to be, a primary source of environmental data, new technology will have a significant role to play in the future NOAA fleet. OMAO, in coordination with other NOAA offices and federal agencies, is evaluating and deploying remotely piloted underwater and aircraft systems that could significantly contribute to environmental observations. OMAO's ongoing challenge is to meet the growing demand for in situ scientific data while providing the highest level of service. To better serve the needs of the Nation, NOAA is examining the composition of the fleet through an exhaustive and critical review of at-sea science and observation requirements. Our objective is to develop a clear, cost-efficient path forward to ensure that the NOAA fleet can continue to conduct at-sea surveys and research vital to fisheries management, updating nautical charts, responding to natural and manmade disasters, and understanding coastal and marine systems more fully. Meeting these requirements is essential to developing sustainable, science-based management and conservation plans that protect the health and resiliency of these resources over the long-term.

We continue our efforts to build a civilian and NOAA Corps officer work force that is uniquely qualified to gather critical environmental intelligence and be adaptive and responsive to a changing world and work to expand our partnerships with other federal agencies. For example, NOAA Corps officers are currently assigned to work in the Department of Defense, National Science Foundation, and the U.S. Senate among others where they lend their expertise and service. We also continue to strengthen our partnership with the U.S. Coast Guard. Our basic NOAA Corps officer training class is held at the U.S. Coast Guard Academy, where newly commissioned officers train alongside Coast Guard officer candidates, developing skills and professional relationships that will benefit both services, especially during challenging times. Active collaboration the Federal family is critical to ensuring the long-term capability and success of the federal ocean infrastructure. Our partners' success is our success. The men and women of OMAO and the NOAA Corps provide environmental intelligence for a dynamic world as they serve our nation every day from the farthest seas to the highest skies.

NOAA Commissioned Officer Corps

– Honor, Respect, Commitment –

The NOAA Commissioned Officer Corps (NOAA Corps) is one of the United States' seven Uniformed Services and as commissioned officers serve with the 'special trust and confidence' of the President. NOAA Corps officers are an integral part of the National Oceanic and Atmospheric Administration (NOAA), an agency of the U.S. Department of Commerce. With an authorized strength of 321 officers, the NOAA Corps serves throughout the agency's Line and Staff Offices to support nearly all of NOAA's programs and missions. The combination of commissioned service and scientific expertise makes these officers uniquely capable of leading some of NOAA's most important initiatives. The NOAA Corps is part of NOAA's Office of Marine and Aviation Operations (OMAO) and traces its roots back to the former U.S. Coast and Geodetic Survey, which dates back to 1807 and President Thomas Jefferson. The U.S. Coast and Geodetic Survey Corps was founded in 1917 to provide officers to command U.S. coastal survey ships and field survey parties locally and abroad. In 1970, NOAA was created to develop a coordinated approach to oceanographic and atmospheric research and subsequent legislation converted the commissioned officer corps to the NOAA Corps. The NOAA Corps today provides a cadre of professionals trained in engineering, earth sciences, oceanography, meteorology, fisheries science, and other related disciplines. Corps officers operate NOAA's ships, fly aircraft, manage research projects, conduct diving operations, and serve in staff positions throughout NOAA. The NOAA Corps celebrates its Centennial year in 2017.

Benefits of the NOAA Corps to the Nation

The combination of commissioned service with scientific and operational expertise, allows the NOAA Corps to provide a unique and indispensable service to the nation. Discipline and flexibility are inherent in the NOAA Corps personnel system. Officers are trained for positions of leadership and command in the operation of ships and aircraft; in the conduct of field projects on land, at and under the sea, and in the air; in the management of NOAA observational and support facilities; as members or leaders of research efforts; and in the management of various organizational elements throughout NOAA. NOAA Corps officers must be technically competent to assume positions of leadership and command in NOAA and Department of Commerce programs and in the Armed Forces during times of war or national emergency. NOAA Corps officers enable NOAA to fulfill mission requirements, meet changing environmental concerns, take advantage of emerging technologies, and serve as environmental first responders. For example:

- In 2016, NOAA aircraft conducted research and reconnaissance missions into Hurricane Matthew, and post-storm flooding reconnaissance missions from Florida to Virginia with FEMA. NOAA Ship *Ferdinand Hassler* conducted post-storm surveys within of the ports of Charleston and Savannah within 48 hours to re-open the ports to maritime commerce, worth more than $5M per hour.
- In 2015, NOAA aircraft conducted research and surveillance missions into some of the planet's most extreme weather, ranging from Hurricane Patricia, the strongest on record in the Western hemisphere, to severe storms over the U.S. Great Plains region. In addition, NOAA aircraft responded to unprecedented flooding in South Carolina using advanced sensors and imaging technology to provide emergency response managers with critical real-time information needed to respond to this disaster.
- After Hurricane Sandy in 2012, NOAA Ships *Thomas Jefferson* and *Ferdinand R. Hassler* conducted emergency bathometric surveys to locate possible submerged navigational hazards in the ports of New York and Virginia. These surveys enabled the ports to reopen quickly. Aerial images of storm-stricken regions, taken by NOAA aircraft, helped residents and emergency workers to quickly assess the condition of houses, bridges, and vital infrastructure.
- In 2010, the NOAA fleet and the NOAA Corps played a major role in the response to the BP *Deepwater Horizon* oil spill in the Gulf of Mexico. NOAA's entire Atlantic fleet and over a quarter of the total strength of the NOAA Corps were deployed to the Gulf following the spill, developing mission plans and assisting response efforts.